

Crystal Growth of ZnSe and Related Ternary Compound Semiconductors by Vapor Transport in Low Gravity

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Crystals of ZnSe and related ternary compounds, such as ZnSeS and ZnSeTe, will be grown by physical vapor transport in the Material Science Research Rack (MSRR) on International Space Station (ISS). The objective of the project is to determine the relative contributions of gravity-driven fluid flows to the compositional distribution, incorporation of impurities and defects, and deviation from stoichiometry observed in the crystals grown by vapor transport as results of buoyance-driven convection and growth interface fluctuations caused by irregular fluid-flows on Earth.

The investigation consists of extensive ground-based experimental and theoretical research efforts and concurrent flight experimentation. The objectives of the ground-based studies are (1) obtain the experimental data and conduct the analyses required to define the optimum growth parameters for the flight experiments, (2) perfect various characterization techniques to establish the standard procedure for material characterization, (3) quantitatively establish the characteristics of the crystals grown on Earth as a basis for subsequent comparative evaluations of the crystals grown in a low-gravity environment and (4) develop theoretical and analytical methods required for such evaluations. ZnSe and related ternary compounds have been grown by vapor transport technique with real time in-situ non-invasive monitoring techniques. The grown crystals have been characterized extensively by various techniques to correlate the grown crystal properties with the growth conditions.